**Materials Sciences and Engineering**

**MSEN 3301** Introduction to Nanoscience and Nanotechnology (3 semester credit hours) Introduction to the underlying principles and applications of the emerging field of nanotechnology and nanoscience. Intended for a multidisciplinary audience with a variety of backgrounds. Introduces tools and principles relevant at the nanoscale dimension. Discusses current and future nanotechnology applications in engineering, materials, physics, chemistry, biology, electronics, and energy. Prerequisites: CHEM 1311 and (MATH 2415 or MATH 2419 or equivalent) and (PHYS 2326 or PHYS 3342). (Same as ECS 3301) (3-0) Y

**MSEN 3302** Microscopy, Spectroscopy, and Nanotech Instrumentation (3 semester credit hours) The instructor will guide students in learning and practicing the techniques for using laboratory instruments common to the field of nanotechnology. Techniques include ion scattering, electron spectroscopy, diffraction, Raman and UV-vis-NIR spectroscopy, SEM, SFM, and thin film growth/deposition and processing. Prerequisites: CHEM 1311 and (MATH 2415 or MATH 2419 or equivalent) and PHYS 2326. (3-0) Y

**MSEN 3304** Materials Science for Sustainable Energy (3 semester credit hours) The global community is actively developing renewable energy sources to replace fossil fuels and to minimize their negative impact on climate change. Materials science is providing key enabling technologies for the development of diverse renewable energy sources (solar cells, biofuels, wind, geothermal etc.) and their practical utilization (energy storage, fuel cells, electrical vehicles, etc.). This course examines energy and climate issues, and describes the role of materials science and nanotechnology in the development and implementation of sustainable energy solutions. Prerequisites: CHEM 1312 and (MATH 2415 or MATH 2419 or equivalent) and (PHYS 2326 or PHYS 3342). (3-0) Y

**MSEN 3310** Introduction to Materials Science (3 semester credit hours) This course provides an intensive overview of materials science and engineering focusing on how structure/property/processing relationships are developed and used for different types of materials. The course illustrates roles of materials in modern technology by case studies of advances in new materials and process. Topics include atomic structure, crystalline solids, defects, failure mechanisms, phase diagrams and transformations, metal alloys, ceramics, polymers as well as their mechanical, thermal, electrical, magnetic and optical properties. Credit cannot be received for both MECH 3360 and (ECS 3310 or MSEN 3310). Prerequisites: CHEM 1311 and (MATH 2415 or MATH 2419 or equivalent) and PHYS 2326 or instructor consent required. (Same as ECS 3310) (3-0) Y

**MSEN 4391** Technology of Plasma (3 semester credit hours) Plasmas are critical to making the best electronic devices. This class will be an introduction to the technology required to make and use these plasmas. Topics include: high-vacuum technology (gas properties, pumps, pressure gauges, flow-meters, gas composition analysis) and plasma technology (etch, deposition, and lamps). Recommended: ENGR 3341. Prerequisites: ENGR 3300 and (CE 3310 or EE 3310). (Same as EE 4391) (3-0) T

**MSEN 4V95** Undergraduate Research (1-9 semester credit hours) Provides students with experience in a laboratory setting. Hands-on opportunity to interact with professors and companies in the field. May be repeated for credit (9 semester credit hours maximum). Prerequisites or Corequisites: MSEN 3301 and MSEN 3302 and instructor consent required. ([1-9]-0) S